

<b>Devi Ahilya University, Indore, India Institute of Engineering &amp; Technology</b>				<b>IV Year B.E.(Information Technology (FullTime)</b>			
<b>Subject Code &amp; Name</b>	<b>Instructions Hoursper Week</b>			<b>Credits</b>			
<b>7ITRE1 Machine Learning</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>Total</b>
<b>Duration of Theory Paper: 3 Hours</b>	<b>3</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>

### Learning Objectives:

- To introduce the theoretical foundations of machine learning & Deep Learning.
- To provide practical experience of applying machine learning & DeepLearning techniques
- To investigate new problems where machine learning techniques can do better.

**Prerequisites:**Basic knowledge of probability and statistics and computer programming.

### Course Outcomes (CO) and Program Outcomes (PO) Mapping

<b>CO No.</b>	<b>Course Outcome</b>	<b>Program Outcomes (PO)</b>
CO1	Theoretical Foundations - Acquire a solid understanding of the theoretical foundations of machine learning, including key concepts, algorithms, and applications.	PO1, PO2, PO12
CO2	Practical Skills - Develop practical skills in applying machine learning techniques to real-world problems using Python and relevant libraries.	PO2, PO4, PO5, PO10
CO3	Model Evaluation - Gain proficiency in evaluating machine learning models using various metrics and techniques to ensure their effectiveness and reliability.	PO2, PO4, PO5
CO4	Problem-Solving - Apply machine learning methods to solve complex problems in various domains, demonstrating the ability to select and implement appropriate algorithms.	PO1, PO2, PO4, PO5, PO9, PO10, PO11, PO12
CO5	Research Engagement - Engage in research activities to investigate new machine learning techniques and contribute to ongoing advancements in the field.	PO3, PO4, PO9, PO12

### CO-PO Relationship Matrix

<b>CO</b>	<b>PO-1</b>	<b>PO-2</b>	<b>PO-3</b>	<b>PO-4</b>	<b>PO-5</b>	<b>PO-6</b>	<b>PO-7</b>	<b>PO-8</b>	<b>PO-9</b>	<b>PO-10</b>	<b>PO-11</b>	<b>PO-12</b>
CO1	3	2	-	-	-	-	-	-	-	-	-	2
CO2	-	2	-	2	3	-	-	-	-	2	-	-
CO3	-	3	-	3	3	-	-	-	-	-	-	-
CO4	3	3	-	3	3	-	-	-	2	2	2	3

CO	PO-1	PO-2	PO-3	PO-4	PO-5	PO-6	PO-7	PO-8	PO-9	PO-10	PO-11	PO-12
CO5	-	2	3	3	-	-	-	-	3	-	-	3

## COURSE OF CONTENTS

### Unit-I

#### Introduction:

Definition, Applications of machine learning, Machine Learning Workflow, Define Problem, Specify Inputs & Outputs, Exploratory Data Analysis, Data Collection, Data Preprocessing, Data Cleaning, Visualization, Model Design, Training, and Offline Evaluation, Model Deployment, Online Evaluation, and Monitoring, Model Maintenance, Diagnosis, and Retraining.

### Unit-II

Machine Learning Algorithms:

Aspects of developing a learning system: Training Data, Validation Data and Test data, Types of learning: supervised, unsupervised and Reinforcement learning, Classification and Regression learning methods, Linear Regression with One Variable, Linear Regression with Multiple Variables, Logistic Regression, Support Vector Machine.

### Unit-III

#### Introduction to Neural Networks:

Neural Network Representation, Perceptron, Artificial Neural Network, Backpropagation algorithm. Backpropagation Intuition, Random Initialization, Diagnosing Bias vs. Variance, Regularization and Bias/Variance. Learning Rate, implementing gradient descents, training neural networks, Cost Function.

### Unit-IV

#### Deep Learning:

Introduction, Application, Deep neural network, Single Layer Perceptron Model (SLP), Multilayer Perceptron Model (MLP), Fully Connected (FC) Layer, Convolutional neural networks, recurrent neural networks, Activation Function, Sigmoid, Rectified Linear Units (ReLU), tanh, SoftMax, Pooling Layer, Bias, Variance, Hyperparameters, Data Augmentation,

### Unit-V

#### Convolutional Neural Networks:

Terminologies: Channels, pooling, Padding, Stride, Preparing the image, Generate filters, Convolve using filters Measuring performance, CNN models: LeNet, AlexNet, ResNet, MobileNet, YoLo Algorithm, Recurrent Neural Networks, Generative Adversarial Networks.

## **RECOMMENDED BOOKS**

- [1] Michael Bowles, Machine Learning in Python, John Wiley & Sons, Inc., 2015
- [2] Jason Brownlee, Machine Learning Mastery With Python, 2016.
- [3] Machine Learning with TensorFlow, Version 10, 2017, Manning Publications.
- [4] Ian Goodfellow and Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016

## **Learning Outcomes:**

Upon Completing the Course, students will have knowledge of various machine learning & Deep Learning techniques useful for solving the real world problems.

## **List of Assignment in Machine Learning Lab:**

- Problem based on different machine Learning & Deep Learning
- Works on different machine learning & Deep Learning Tools
- Case Studies on different datasets